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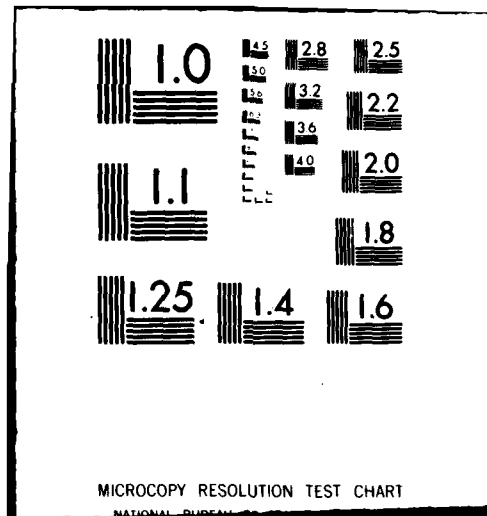
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TECHNICAL REPORT

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ABSTRACTS OF RESEARCH PROJECT REPORTS BY NATIONAL NAVAL DENTAL
CENTER FIRST-, SECOND-, AND THIRD-YEAR RESIDENTS - JUNE 1980

by

G. B. PELLEU, JR.

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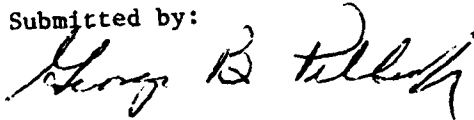
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ADMINISTRATIVE INFORMATION

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ABSTRACT

These abstracts provide a synopsis of research projects conducted by dental officers enrolled in the first-, second-, and third-year residency programs at the National Naval Dental Center, Bethesda, Maryland, during the academic year 1979-1980. The projects were completed in partial fulfillment of the requirements of the programs.

The opinions and assertions contained in these abstracts are the private ones of the writers and are not to be construed as official or as reflecting the views of the Department of the Navy.

Studies involving human subjects were conducted with the approval of the Committee for the Protection of Human Subjects.

Studies involving animal subjects were conducted according to the principles set forth in the Guide for the care and use of laboratory animals, Institute Of Laboratory Resources, National Research Council, DHEW, Pub. No. (NIH) 74-23.

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ABSTRACTS OF FIRST-YEAR REPORTS

No. 1

A CLINICAL EVALUATION OF THE COLOR STABILITY OF COMPOSITE RESTORATIONS PRETREATED WITH FLUORIDES

R. K. Goode

Fluoridation of cavity preparations prior to placement of restorations has been shown to offer certain advantages to the patient. Such pretreatment combined with the use of the new color-stable microfill resins may provide anterior restorations with increased caries resistance and greater color stability. The purpose of this study was to evaluate the color stability of microfill resin restorations in human teeth treated with either acid phosphorylated fluoride (APF) or stannous fluoride. A total of 30 extracted and 78 in situ teeth were used. A third of the teeth from each group were pretreated for 30 seconds with APF; another third with a 10% solution of SnF_2 ; and the remaining third, which served as controls, were not pretreated. All teeth were restored with the same microfill resin (Silar). Extracted teeth were thermocycled at 6° and 45° C and incubated in a strong solution of tea. In a double-blind study, three dentists evaluated the restorations for staining. Restorations in nonextracted teeth were evaluated immediately after placement and 1, 2, and 5 months postplacement. The results showed no significant differences in staining between the controls and the pretreated teeth for any of the test periods. Restorations in extracted teeth were evaluated immediately after placement and 1 and 2 months postplacement. These results showed that after 1 month extracted teeth pretreated with APF showed a significantly greater degree of staining than the teeth pretreated with SnF_2 and the untreated controls. Our results suggest that pretreating cavity preparations with SnF_2 prior to the placement of microfill resin restorations may be an acceptable procedure; however, further testing is needed to confirm this finding.

No. 2

A COMPARISON OF THE EFFECTS OF VENTING AND DIE RELIEF TECHNIQUES ON THE MARGINAL FIT OF POSTERIOR CROWNS

G. R. Gordon

Complete seating of a casting during cementation is necessary for the clinical success of a cast restoration. Investigators agree that some type of internal relief or a provision for the escape of excess cement is necessary to enable the casting to be completely seated. However, no study has been reported that directly compares the effects of venting and die relief before and after cementation. The purpose of this study was to compare the effects of these two techniques, both of which promote optimal seating of castings, after cementation with zinc phosphate cement. Thirty extracted human molars were prepared to receive full gold castings. Ten control teeth received nonrelieved, nonvented castings; 10 teeth received nonrelieved, vented castings; and 10 teeth received die-relieved castings. Crowns were seated with a press exerting 10 kg force. Margins were measured with a measuring microscope before and after cementation. Marginal

adaptation was defined as the difference between the measurements before and after cementation. A mean marginal adaptation value of $113 \pm 100 \mu\text{m}$ was found for the nonrelieved, nonvented castings of the control teeth. This value was significantly higher than either the $12 \pm 30 \mu\text{m}$ of the nonrelieved, vented castings or the $5 \pm 20 \mu\text{m}$ of the die-relieved castings. Statistical analysis of the results indicated that both the venting and die-relief techniques reduced marginal discrepancies significantly. Although the difference between the vented group and the die-relieved group was not significant, the die-relief technique offers several clinical advantages. It saves time and it can be used with any type of crown, including porcelain-to-metal castings.

No. 3

A COMPARISON OF THE OSTEOGENIC POTENTIAL OF TWO PREPARATIONS OF DECALCIFIED FREEZE-DRIED BONE ALLOGRAFT

K. M. Klein

The Urist and the Navy Tissue Bank methods of preparing decalcified freeze-dried bone allografts (DFDBA) were compared for osteogenic potential using the guinea pig model system. Cortical bone from 10 donor guinea pigs was equally divided for processing according to respective accepted protocols. Samples from each method were sealed within porous nylon-mesh chambers, which were then implanted with bilateral random distribution in the calvaria of 60 guinea pigs. Six animals were sacrificed at each of the following intervals postgrafting: 7, 14, 21, 28, 35, 42, 49, 63, 77, and 91 days. Three days before sacrifice, the animals were injected intraperitoneally with dose-calibrated $^{85}\text{SrCl}_2$. At sacrifice, the nylon-mesh chambers and samples of normal calvaria were removed, weighed, and placed in scintillation vials containing Formalin for radioactivity assessment. An osteogenic index was computed on the basis of the weight of the graft material and the specific activity of the ^{85}Sr . At this time, data have been accumulated through 91 days of bone growth. Histological evaluation will be performed in the coming year to confirm the rate of new bone growth. Although statistical analysis of these data is not yet available, trends depicted on a graph of the osteogenic index suggest a superior performance of the graft material prepared according to the Urist method. This advantage is noted over the 28- to 42-day period that is believed to be the peak time of new bone formation for allogenic grafts. If this advantage proves to be statistically significant, the use of DFDBA as prepared by the Navy Tissue Bank method might involve a clinical compromise.

No. 4

A COMPARISON OF ULTRASONIC AND HAND FILING TECHNIQUES ON CURVED ROOTS OF LOWER MOLARS

R. J. Beaudry

Studies have demonstrated that ultrasonic filing is superior to hand filing in debriding straight root canals of anterior teeth. The purpose of this study was to determine whether ultrasonic filing would work equally well in debriding the curved root canals of posterior teeth. The mesial root canals of seven extracted human mandibular molars have been tested at this

time. All the canals had a 25-30 degree of curvature. Three canals were ultrasonically filed, three were hand filed, and one (control) was not filed. The ultrasonic filing was done with a P-1 scaler that had been modified to accept files of varying sizes. All teeth were filed with Nos. 10-25 files. Each file was used for 2 minutes, and 2 ml of distilled water was used as an irrigant in each canal before instrumentation and after each succeeding file. After debridement, the crown of each tooth was removed, and the mesial and distal roots were separated. The distal root was discarded and the mesial root split longitudinally. Photomicrographs (160X and 400X magnification) of the apical 1, 2, and 3 mm of each root were taken with a scanning electron microscope. In a blind study, three dentists examined the photomicrographs of the canals debrided by ultrasonic and hand filing techniques to judge the effectiveness of the debridement. Their responses were statistically compared, and it was found there was no significant difference in effectiveness of debridement between the ultrasonic and hand filing techniques. These preliminary results suggest that ultrasonic filing is not superior to hand filing in debriding the apical 3 mm of curved root canals. This study is continuing using various other irrigants to determine if debridement efficiency can be improved.

No. 5

THE EFFECT OF CAVITY VARNISH ON PINHOLE PENETRATION
OF SELF-THREADING, SELF-SHEARING PIN SYSTEMS

D. M. Rapps

The purpose of this study was to determine whether the first segment of a 2-in-1 self-threading, self-shearing pin (Thread-Mate System) reached its maximum/optimum retention depth of 2 mm when placed in a pinhole treated with cavity varnish. Four pin channels were prepared in each of 40 recently extracted, caries-free human molars. Two of the channels in each tooth were treated with cavity varnish; the other two channels were not treated, and they served as controls. Teeth were divided into four groups of 10 teeth on the basis of pin size (Regular or Minim) and method of insertion (hand wrench or Auto Klutch). The depth of pin penetration into varnished and unvarnished channels was calculated. The results indicate that statistically there is a significant difference in depth of pin penetration between pins placed in varnished channels and those placed in unvarnished channels. In all four test groups, the first segments of the pins penetrated less fully into the varnished channels than into the unvarnished channels. However, this investigator believes that the differences in depth are so minimal that they would not be important in a practical, clinical environment.

No. 6

EVALUATION OF DECALCIFIED FREEZE-DRIED BONE ALLOGRAFTS
COMBINED WITH AUTOGENOUS BONE IN PERIODONTAL OSSEOUS DEFECTS

D. E. Weiner

The purpose of this study was to evaluate the osteogenic potential of decalcified cortical freeze-dried bone allografts combined with autogenous bone in treating periodontal osseous defects in humans. The allograft material was procured through the Navy Tissue Bank. The human

cortical bone was processed according to a modification of the technique described by Urist. The allograft material was ground to a particle diameter size of 250 μ m to 500 μ m and stored under vacuum in sterile glass bottles. Fresh autogenous bone was harvested at the time of initial surgery from various sites and mixed in a 1:1 ratio by volume with the allograft bone. Periodontists grafted and documented a total of 40 sites. The graft material was used in 1-wall, 2-wall, wide-mouth 3-wall, combination, and furcation defects. To serve as a control, 10 sites were prepared in the same manner as the grafted sites but without the graft material being placed. Custom acrylic stents and calibrated periodontal probes were used to measure all sites before and during surgery; further measurements will be taken at the reentry surgery 6 to 12 months after the initial surgery. Observations so far have been encouraging. Collaborators have found that the consistency of the combined graft material makes it easy to work with during surgery. One-week postoperative periapical radiographs have confirmed that the graft material was retained at the defect sites. The postoperative course of healing has progressed normally in all cases. After reentry surgery, initial and reentry measurements will be compared to evaluate the osteogenic potential of the combined graft material.

No. 7

AN EVALUATION OF THE CLINICAL USE OF FREEZE-DRIED BONE ALLOGRAFTS
IN PERIODONTAL OSSEOUS DEFECTS

J. M. Ambrose

A clinical evaluation of freeze-dried crushed cortical bone allografts in human periodontal osseous defects has been in progress for several years at the National Naval Dental Center, Bethesda, Maryland. During the study, 84 clinicians used freeze-dried bone allografts to treat 2,039 periodontal osseous defects in 756 patients. This is an interim report. Its purpose was to assess the data already collected in the study and to gather additional data where necessary. Once sufficient data are collected, the data will be programmed for computer analysis to evaluate the clinical effectiveness of freeze-dried bone allografts in periodontal osseous defects. Records of all 756 patients who received grafts were on file at the Navy Tissue Bank. These records were reviewed for completeness. The review identified 431 graft sites as being completely documented. Incompletely documented sites were identified and questionnaires were sent to the participating clinicians. Monthly followup questionnaires were sent when necessary. Response to the questionnaires accounted for an additional 175 graft sites with complete documentation. To date, complete documentation is available for 274 (36%) of the 756 patients treated and for 606 (30%) of the 2,039 of the graft sites. Information is still being gathered on the 1,433 sites that remain incompletely documented.

No. 8

AN EVALUATION OF THE EFFECT OF RECAST NONPRECIOUS METAL
ON PORCELAIN BOND STRENGTH

J. C. Innes and J. H. Lutskus

The use of nonprecious metal alloys in ceramometal restorations is increasing. A thorough knowledge of these alloys is necessary if

they are to be used successfully. The purpose of this study was to determine what effect the use of a recast nonprecious metal alloy (C&B alloy) would have on the strength of the porcelain-metal bond. Porcelain was baked onto nonprecious metal alloy test tabs that contained all new metal (6 samples) or new-to-recast metal in a ratio of 3:1 (9 samples), 1:1 (8 samples), and 1:3 (7 samples). The tabs were fractured with a four-point bend-test fixture and the force required to produce fracture of the porcelain was determined. It was found that a significantly greater force was needed to fracture the porcelain on the tabs containing recast metal than was needed to fracture the porcelain on the control tabs, which indicated that there had been an increase in the porcelain bond strength. Visual examination of the porcelain fragments recovered during testing revealed that as the amount of recast metal in the test tabs increased, the intensity of the color of the porcelain adjacent to the metal increased. This observation suggests that a change occurred in the composition of the oxides on the metal surface. The study will be continued in an effort to verify these preliminary results, to chemically analyze the metal test tabs for oxide composition, and to determine the relationship between the oxide layer and porcelain bond strength.

No. 9

AN EVALUATION OF THE SEALING ABILITY OF A NON-EUGENOL-CONTAINING ROOT CANAL SEALER IN HUMAN EXTRACTED TEETH USING ^{45}Ca

R. L. Ives

Most root canal sealers contain zinc oxide and eugenol, which have been shown to cause an inflammatory tissue response in animals and humans. A noneugenol sealer is now commercially available; however, few studies have been reported on its sealing ability. The purpose of this investigation was to determine the sealing ability of a non-eugenol-containing root canal sealer in straight canals by means of a radioisotope method of detecting leakage. Thirty-five extracted straight roots of human teeth were coated with two layers of nail polish and instrumented with a flared preparation until a No. 80 file was passed through the apex. The teeth were obturated with laterally condensed gutta-percha with no sealer, a eugenol-containing sealer, or a non-eugenol-containing sealer. The access opening was sealed with zinc oxide and eugenol cement. The obturated teeth, stored at room temperature in a humidifier, were soaked for 1 hour in a radioisotope solution of ^{45}Ca with a concentration of 0.1 mCi/ml. After they were scrubbed so that surface ^{45}Ca was removed, the teeth were mounted in acrylic Formatray, sectioned longitudinally through the apical and access ends, and evaluated for leakage with an autoradiographic technique. Results of chi-square analysis showed that all the teeth obturated without a sealer leaked. Significantly fewer teeth obturated with a eugenol sealer leaked. The results for teeth with the non-eugenol-containing sealer are inconclusive at this time. Additional study with an increased number of samples and a more refined methodology is continuing.

No. 10
THE EXPERIMENTAL PRODUCTION OF CARCINOMAS IN HAMSTER POUCHES
UTILIZING COMMERCIALY PREPARED ALCOHOL BEVERAGES

D. M. Arendt

The literature to date is inundated with information on contaminants in alcoholic beverages that may act as procarcinogens but no histologic studies are available to support this premise. The purpose of this study was to evaluate the potential carcinogenicity of a commercially available alcoholic beverage on the surface epithelium of the hamster pouch. Forty-two male and female Syrian hamsters 2 months of age and weighing approximately 100 grams each were divided into seven equal groups for testing. The animals were grouped according to beverage received as their only source of liquid during a 14-week test period. Animals in group I received water only; groups II and V, 10% ethanol; groups III and VI, diluted sherry (10% alcohol); and groups IV and VII, full-strength sherry (20% alcohol). In addition, three times weekly, the left pouches of animals in groups I through IV were swabbed with water and the right pouches were swabbed with a 0.5% solution of dimethyl benzanthrane, a known carcinogen. Animals in groups V through VII acted as controls and received no swabbings. Two animals from each group were sacrificed 10, 12, and 14 weeks after the beginning of the experiment. The right and left pouches were examined grossly for presence of nodules and histologically for evidence of atypical cellular changes. Generally, the animals drinking diluted and full-strength sherry showed malignancies sooner and in greater numbers than the animals drinking ethanol or water. The animals on full-strength sherry developed malignancies 2 weeks earlier than the animals in the other groups.

No. 11
AN IN VITRO MICROLEAKAGE STUDY ON THE EFFECTS OF
STANNOUS FLUORIDE ON ACID-ETCHED ENAMEL OF CLASS V
COMPOSITE RESTORATIONS

K. A. Kirkland

The purpose of this study was to evaluate the effect of stannous fluoride application to acid-etched enamel surfaces on microleakage of extracted human teeth restored with composite resins. Thirty extracted human molars were used. Acid-etched Class V composite preparations were made on two opposite surfaces of each tooth. The teeth were randomly divided into two groups of 15, one group to be filled with Concise, the other with Silar. Each tooth had a control preparation and an experimental preparation. Both preparations were filled according to the manufacturer's instructions. However, before the experimental preparation was filled, the acid-etched enamel surface was treated with an 8% solution of stannous fluoride for 1 minute. The teeth were finished with Sof-Lex disks, alternately thermocycled 500 times at 6° and 45° C, and soaked in ⁴⁵Ca isotope solution for 1 hour. The teeth were sectioned horizontally with a diamond cut saw and placed on radiographic film for 18 hours. The autoradiographs were then evaluated for evidence of microleakage. Statistical analyses for both resin groups showed no significant difference in the amount of microleakage between the fluoride-treated and the control preparations.

Statistical comparisons between the two resin groups revealed that Concise leaked significantly less than Silar. Although the initial results indicate that stannous fluoride applied to acid-etched enamel does not increase the microleakage, further investigation is being undertaken to determine whether there is a relationship between the extent of microleakage and the maturity of the tooth.

No. 12

A MICROBIAL EVALUATION OF THE SEALING ABILITY
OF A HYDROPHILIC PLASTIC ROOT CANAL FILLING MATERIAL

W. A. Walker, Jr.

A new hydrophilic plastic polymer called Hydron is now commercially available for use as a root canal filling material. Hydron is introduced by syringe as a paste into the root canal system, where it autopolymerizes to form a solid mass. The purpose of this study was to evaluate quantitatively the sealing ability of Hydron in preventing leakage of resistant bacterial spores or radioisotope solution into the palatal root canals of extracted human maxillary first molars. A total of 42 roots were used in the study. All the root canals were prepared endodontically, sterilized, and stored in a high humidity incubator at 37° C. Fifteen canals were filled with gutta-percha and a zinc oxide-eugenol sealer, and another 15 canals were filled with Hydron. Five extirpated but unfilled canals served as positive controls, and 5 sealed, intact canals served as negative controls. The roots were immersed in a suspension of resistant bacterial spores for 48 hours. Bacterial recovery was accomplished using a pour plate technique. After the plates were incubated for 24 hours, microbial recovery values were determined. Canals filled with gutta-percha or Hydron showed leakage. The microbial recovery values for canals filled with these materials were significantly greater than those for the negative controls. In preliminary tests, calcium-45 autoradiographs of a root canal filled with gutta-percha and another with Hydron showed radioisotope leakage.

No. 13

PHOTOELASTIC STRESS ANALYSIS OF THE FERRULE EFFECT
IN A DOWEL-CORE RESTORED TOOTH MODEL

S. W. Malley

Several investigations have been undertaken on the design and effectiveness of the dowel-core restoration, but these studies never included the ferrule effect, which is achieved by encircling the narrow cervical area of the tooth with a metal collar to provide strength. The purpose of this study was to evaluate the ferrule effect by a qualitative analysis of stress distribution in 2-dimensional photoelastic resin tooth models. Models simulating a proximal view of a maxillary central incisor were constructed of 1/4-inch photoelastic resin. Various restorations were simulated by 1/4-inch aluminum cutouts bonded to the tooth models with an epoxy resin. The tooth models were joined to 1/4-inch photoelastic resin bone models with a silastic adhesive, which was used to simulate the periodontal membrane. Models were mounted in a test jig, and a shearing force

was applied at an angle of 80 degrees to the tooth's long axis. Stress patterns were observed and photographed in both dark and light fields to obtain fringe counts for qualitative and future quantitative analyses. Models tested were (1) a tooth with no restorations, (2) a tooth with a full crown, (3) a tooth with a dowel-core and crown with no ferrule, and (4) a tooth with a dowel-core and crown with ferrule. Initial results indicate that neither a ferrule nor a dowel influences overall stress patterns in the remaining root section. It is even possible that the ferrule may actually weaken the narrow cervical area by developing stresses at its tooth interface. The study is continuing in an attempt to confirm these initial results.

No. 14

THE SETTING EXPANSION OF DIVESTMENT WHEN USED WITH POLYSULFIDE,
POLYETHER, AND ADDITION-REACTION SILICONE IMPRESSION MATERIALS

G. M. Brown, Jr.

Divestment, when used as an investing and die material, must have an adequate setting expansion to compensate for the solidification and cooling shrinkage of cast gold alloys. The purpose of this study was to measure the linear expansion of Divestment material when used with polysulfide, polyether, and addition-reaction silicone impression materials. A cylindrical stainless steel die was secured to an aluminum base and circular grooves machined-out of the base to allow repeatable placement of custom trays. Identical acrylic resin trays with 2 mm or 4 mm of relief were fabricated. A total of 60 Divestment dies were fabricated, 20 with each impression material. Half of these dies were made using trays of 2-mm relief, half with trays of 4-mm relief. The linear expansion was measured with a measuring microscope. Divestment die expansion percentages were obtained by comparing the Divestment die measurements with the stainless steel die measurements. The Divestment dies made using the polysulfide impression material and trays of 2-mm relief showed a significantly greater expansion than the other Divestment dies. Whether this finding is meaningful for the clinician will be investigated in the second part of this study. Marginal discrepancies of metallic castings will be measured and statistically compared.

ABSTRACTS OF SECOND-YEAR REPORTS

No. 1

COMPARISON OF CORTICAL AND CANCELLOUS FREEZE-DRIED BONE ALLOGRAFTS, BOTH DECALCIFIED AND UNDECALCIFIED, AS INDUCTIVE SUBSTRATES FOR OSTEOGENESIS

J. E. Trapp

Many graft materials have been used in osseous defects, and research is currently being conducted to determine which materials or combination of materials has the greatest osteogenic inductive properties. This investigation was undertaken to compare cortical and cancellous freeze-dried bone allografts, both decalcified and undecalcified, as inductive substrates for osteogenesis. Nylon-mesh chambers were used to implant the graft materials into defects created in the calvarias of 35 guinea pigs. Five animals were sacrificed at each of the following postgrafting intervals: 3, 7, 14, 21, 28, 35, and 42 days. Osteogenesis was quantified by the uptake of $^{85}\text{SrCl}_2$, administered IP, $8 \mu\text{Ci}/100 \text{ gm}$ body weight, 3 days prior to sacrifice. At recovery, weights and scintillation counts were determined for all samples. Sections of calvaria were obtained at sacrifice, and an osteogenic index was calculated by dividing cpm/mg of graft by cpm/mg of calvaria. Based on the osteogenic indices, a growth model was fitted to the data by the method of nonlinear least squares. Decalcified cortical freeze-dried bone allograft demonstrated the greatest osteogenic potential. The other three graft materials were not statistically distinguishable.

No. 2

THE EFFECT OF CHLOROFORM ON THE APICAL SEAL OF TEETH OBTURATED WITH GUTTA-PERCHA AND A ROOT CANAL CEMENT SEALER

J. J. Boyd

One of the primary objectives of endodontic treatment is the obliteration of the root canal space in three dimensions. Chloroform, when used to soften the gutta-percha cone in this procedure, may have a deleterious effect on the apical seal. The purpose of this study was to examine the effect of chloroform on the apical seal of teeth obturated with gutta-percha and a zinc oxide-eugenol type cement. Extracted human teeth were obturated by using one of three methods: (1) gutta-percha dipped in chloroform with no sealer, (2) gutta-percha dipped in chloroform and put into a canal with a zinc oxide-eugenol type sealer, and (3) gutta-percha and the sealer without the chloroform. Thirty teeth were obturated by each method. Methylene blue dye was used to determine sealability, and the length of dye penetration along the dentin/gutta-percha interface was statistically compared for each method. There was significantly more dye penetration in teeth obturated with gutta-percha dipped in chloroform than in teeth obturated without the use of chloroform. These findings indicate that chloroform has a deleterious effect on the apical seal achieved with gutta-percha, with and without the zinc oxide-eugenol type sealer.

No. 3
THE EFFECTS OF A BIOFLAVONOID-ASCORBIC ACID COMPLEX
ON CAPILLARY PERMEABILITY AND FRAGILITY

W. A. Rathbun, Jr.

Abnormal capillary permeability and fragility may produce petechiae, purpura, ecchymoses, prolonged bleeding following surgical procedures, exacerbated inflammatory reactions, and other localized and constitutional symptoms. Many studies have reported the beneficial results of treatment with a bioflavonoid-ascorbic acid complex on certain diseases associated with capillary fragility. This study examined the effect of bioflavonoid-ascorbic acid therapy on capillary fragility. A total of 13 human subjects were treated in a double-blind manner, with 7 subjects receiving a lactose placebo and 6 subjects receiving the vitamin complex. A device called a petechiometer was used to produce capillary fragility and subsequent petechiae by means of a negative pressure applied to the skin. The number of petechiae were counted for all subjects weekly for 1 month prior to treatment, for 1 month during treatment, and for 1 month post-treatment. Using the pretreatment period as the control, comparisons were made between the number of petechiae at pretreatment and treatment phases, and between the number of petechiae at pretreatment and post-treatment phases. The results showed that when petechiae counts were combined for all subjects and statistically compared there was a significant decrease in the number of petechiae counted during treatment with the vitamin complex. These results suggest that administration of a bioflavonoid-ascorbic complex will reduce capillary permeability and fragility in humans.

No. 4
EVALUATION OF DECALCIFIED FREEZE-DRIED BONE ALLOGRAFTS
IN PERIODONTAL OSSEOUS DEFECTS

G. Quintero

It is generally accepted that the most effective graft material in periodontal therapy is fresh autogenous bone, but this material has its limitations. Since the literature supports the use of decalcified freeze-dried bone in periodontal therapy, its evaluation on an extended basis is warranted. The purpose of the study was to evaluate the osteogenic potential of decalcified freeze-dried bone allografts in reconstructing periodontal osseous defects in humans. This evaluation was accomplished under conditions commonly encountered in a periodontal practice. Human cortical bone was obtained from a donor's femur within 24 hours after death. The bone was processed according to a modification of the technique described by Urist. The decalcified freeze-dried bone was ground to a particulate diameter size of 250 μ m to 500 μ m and stored under vacuum in sterile glass bottles. Five periodontists grafted and documented 27 sites in 11 patients. The decalcified freeze-dried bone was used in 1-wall, 2-wall, and 3-wall osseous defects. A stent and a calibrated periodontal probe were used to take presurgical measurements from the base of the stent to the cemento-enamel junction, the free gingival margin, and the base of the pocket. These measurements were taken again at the reentry surgery approximately 5 months after the grafting procedure. The results showed the following mean values

for the 27 defects treated: initial depth, 3.8 mm; amount of osseous regeneration, 2.5 mm; percent regeneration potential, 71%. These preliminary findings demonstrate that decalcified freeze-dried bone has a definite potential as bone-grafting material.

No. 5

AN EVALUATION OF SURFACE QUALITIES OF PRECIOUS AND NONPRECIOUS METALS AND THEIR RELATIONSHIP TO BONDED PORCELAIN STRUCTURE

E. M. Fraleigh and J. E. Morley

One of the most frustrating types of failure in the construction of a ceramometal restoration is a fracture of the porcelain portion of the restoration. One possible cause may be in the metal surface preparation prior to application of the porcelain. The purpose of this study was to determine the effect of smooth and rough surface preparations on the bonding characteristics of ceramometal restorations. A total of 20 test tabs were cast, five each of four different alloys: Jelenko "O", Cameo, Ticon, and C&B. The surface of each tab was finished in three separate sections using metallurgical polishing, air abrading, and white stone grinding techniques. Representative samples of these test tabs were analyzed for surface quality by scanning electron microscopy and topographical surface analysis. The effects of varying surface texture on the production of porcelain defects was then evaluated after application of 3.0 mm of porcelain to the test tabs. The porcelain was subsequently removed in 1.0 mm increments through optical polishing and was evaluated by photomicroscopy at each 1.0 mm increment. The analysis of the photomicroscopy of the porcelain defects occurring with each of the substructure finishes demonstrated that the air-abraded precious metal surfaces had significantly fewer defects than the surfaces finished with the other techniques. This was found to be of borderline significance with the nonprecious metals. The results suggest that the use of an air-abraded ceramometal substructure is a sound clinical procedure.

No. 6

A HISTOLOGIC EVALUATION OF AN EXPEDIENT PULPOTOMY TECHNIQUE USING EUGENOL AND CRESATIN

R. M. Stevens and T. J. Boyer

A study was undertaken to evaluate histologically the expedient pulpotomy technique using eugenol and Cresatin dressings in pulpotomized mature monkey teeth. Three young adult Macaca mulatta monkeys received pulpotomies on 72 teeth. One-third of the specimens were treated with eugenol dressings, one-third with Cresatin dressings, and one-third, a control group, with saline dressings. Pulps in vital, noncarious teeth were amputated with burs, and bleeding was controlled with cotton pellets. Cotton dressings impregnated with medication or saline solution and squeezed dry were placed over the pulp stumps, and the teeth were sealed with IRM bases, Copalite, and occlusal amalgams. The pulpotomized teeth were evaluated at 3 days, 10 days, and 6 months. At the time of writing, only 24 teeth were available for evaluation: 5 teeth of the saline group and 6 of the eugenol group at 3 days, and 6 of the saline group and 7 of the eugenol group at

6 months. Results showed that the response of the pulp was similar with the two dressings at 3 days. There was little or no inflammatory response in any of the 3-day specimens. At 6 months, there was a higher incidence of bacterial contamination or necrosis in the saline-dressed teeth than in the eugenol group. All vital teeth in the eugenol group showed a proclivity to form reparative dentin, either as a bridge at the amputation site or as a thickening of the walls of the root canal. In both groups at 6 months, there was a high incidence of foreign body response at the amputation site, probably because of the presence of the cotton dressing. On the basis of the evidence available, it appears that either saline or eugenol is an acceptable dressing for short-term pulpotomies.

No. 7

THE INFLUENCE OF SELECTED LIGHT INTENSITIES ON COLOR
PERCEPTION WITHIN THE COLOR RANGE OF NATURAL TEETH

G. J. Barna and J. W. Taylor

The intensity of light emitted from the office source is one of several variables that influence the correct matching of tooth color. The purpose of this study was to evaluate the influence of light intensity on the dentist's ability to discriminate color differences within the color range of natural teeth. Tests were conducted in a 156-cubic-foot room painted with a neutral gray enamel paint with a Munsell value of 8. Lighting was provided by two four-bulb fluorescent fixtures fitted with Verd-A-Ray critiColor color-corrected tubes with polarizing diffusers. The bulbs were individually wired to provide footcandle readings of 300, 225, 150, and 75 footcandles at the testing surface. The test materials consisted of two identical sets of 25 color chips that had a range in hue of 0.7 yellow to 2.9 yellow and a chroma range of 2.85-3.6 according to the Munsell color notation system. At each light intensity, participants were asked to match five randomly selected color chips from one set with the identical chips from the other set. Fifty dental officers, seven of whom were found to be color defective, participated in the study. The specialty and years in dental practice were recorded for each participant. The results indicated that color discrimination did not differ significantly among footcandle levels of 300, 225, 150, and 75 and that a participant's specialty or years in practice did not have any effect on color discrimination. It was also found, as would be expected, that color-defective individuals have a much lower success rate than those with normal color vision in matching tooth shades. It is recommended that dentists who are color defective obtain assistance in matching tooth shades.

No. 8

THE SOFT TISSUE ATTACHMENT TO CITRIC-ACID-TREATED ROOT SURFACES
IN RHESUS MONKEYS FOLLOWING PULPOTOMY

D. E. Mitchell

This investigation was undertaken to evaluate the soft tissue attachment to citric-acid-treated root surfaces in a female rhesus monkey after pulpotomy. Saline pulpotomies on teeth Nos. 12 and 13 and a Cresatin pulpotomy on tooth No. 26 were performed 4-9 months be-

fore periodontal surgery. Eighty-three days before sacrifice, facial full-thickness flaps and facial bone removal created radicular dehiscences on teeth Nos. 12, 13, and 26. Cementum was removed, and the root was notched to indicate bone level. Citric acid with a pH of 1.0 was applied to the dentin of teeth Nos. 12 and 13 for 2 minutes. Tooth No. 26 received no citric acid. All flaps were replaced and sutured. After the animal was sacrificed, the teeth were fixed in 10% Formalin and demineralized in 10% ethylenediamine tetra-acetate solution. Serial sectioning at 5 μ m and staining of every fifth section with hematoxylin and eosin provided 114 sections for study. All of the 39 sections with identifiable root notches had regeneration of bone, a functional periodontal ligament, and cementum to a height approaching presurgical levels. However, the cementum was not adherent to the dentin of the non-acid-treated tooth. All specimens had pulp tissue consistent with vitality. The teeth treated with saline pulpotomies and citric acid had connective tissue fibers inserted into the root surface coronal to the new bone. The tooth treated with a Cresatin pulpotomy without citric acid showed apical epithelial migration to the new crestal bone level. The pulpal and periodontal response to citric acid without pulpotomy is currently being evaluated in 32 teeth from two rhesus monkeys.

No. 9
THE SURFACE HARDNESS AND TEXTURE OF
DIVESTMENT USED WITH REVERSIBLE HYDROCOLLOID

J. D. Schroeder and R. B. Linville

Divestment is an accurate gypsum refractory material that can be used as a die material and as an investment material for dental castings. The accuracy of reversible hydrocolloid impression materials has been well documented. It would seem reasonable to assume that a more consistently accurate result would occur if the Divestment technique could be used with these materials. However, such a use has been discouraged because of the suspected deficiencies in the surface qualities of the resulting dies. The purpose of this study was to determine whether Divestment, used with reversible hydrocolloid impression materials, produces a die with acceptable surface qualities. The surface hardness and smoothness qualities of Vel-Mix, a commonly used die material, and Divestment were compared. Hardness comparisons were measured with the Rockwell superficial hardness tester. Twenty-four test samples of each material were fabricated. Four hardness tests were made and recorded for each sample, with the sample being tested once in each of its quadrants. The results of the hardness tests for Divestment showed a mean Rockwell hardness value of 82 ± 2.8 SD (96); for Vel-Mix the mean hardness value was 86 ± 3.3 SD (96). Both figures exceeded the ADA-recommended standard of 80 for improved stone. In a blind study, dentists subjectively evaluated the surface smoothness by examining photomicrographs of test samples. Six dentists compared two scanning electron photomicrographs (65X magnification) of each test material. The results were inconclusive. In another series of comparison, 16 dentists compared two light photomicrographs (10X magnification) of each test material, and they all selected the photomicrographs of the Vel-Mix samples as displaying the smoother surfaces. Despite these smoothness results, we believe that both materials compare favorably and can be used as an acceptable die stone when poured into a reversible hydrocolloid impression.

ABSTRACT OF THIRD-YEAR REPORT

No. 1

A COMPARATIVE STUDY OF MAXILLOFACIAL ADHESIVES

D. W. Anderson

Clinically, not all prosthetic adhesives can be expected to solve the problem of obtaining an adequate tissue-prosthesis bond. Furthermore, no studies are available that might aid in the selection of the best adhesive for use with prosthetic facial materials. The purpose of this study was to evaluate four currently used medical adhesives for tissue-prosthesis bonding strength and for ease of cleansability when used with two different prosthetic facial materials. Test tabs were fabricated from silicone adhesive type A and polysiloxane MDX4-4210. The adhesives tested were Medico, Pros-aide, Epithane-3, and Hollister. Test tabs were applied with the different adhesives to the upper arms of seven subjects (six men and one woman) for periods of 8 and 24 hours. Tensile force measurements were recorded when the tabs were pulled off with a dynamometer. It was found that the Hollister adhesive had superior retentive qualities, but it fractured at the prosthesis-adhesive interface and required the use of solvents for adequate cleaning. Medico adhesive was found to be the least retentive and also required the use of solvents for cleaning. Pros-aide and Epithane-3 adhesives, on the other hand, separated equally between the tissue and the prosthesis and were more easily cleaned off without the use of solvents. For this reason it is suggested that either of the latter adhesives be used with most maxillofacial prostheses when patient acceptability is demonstrated.

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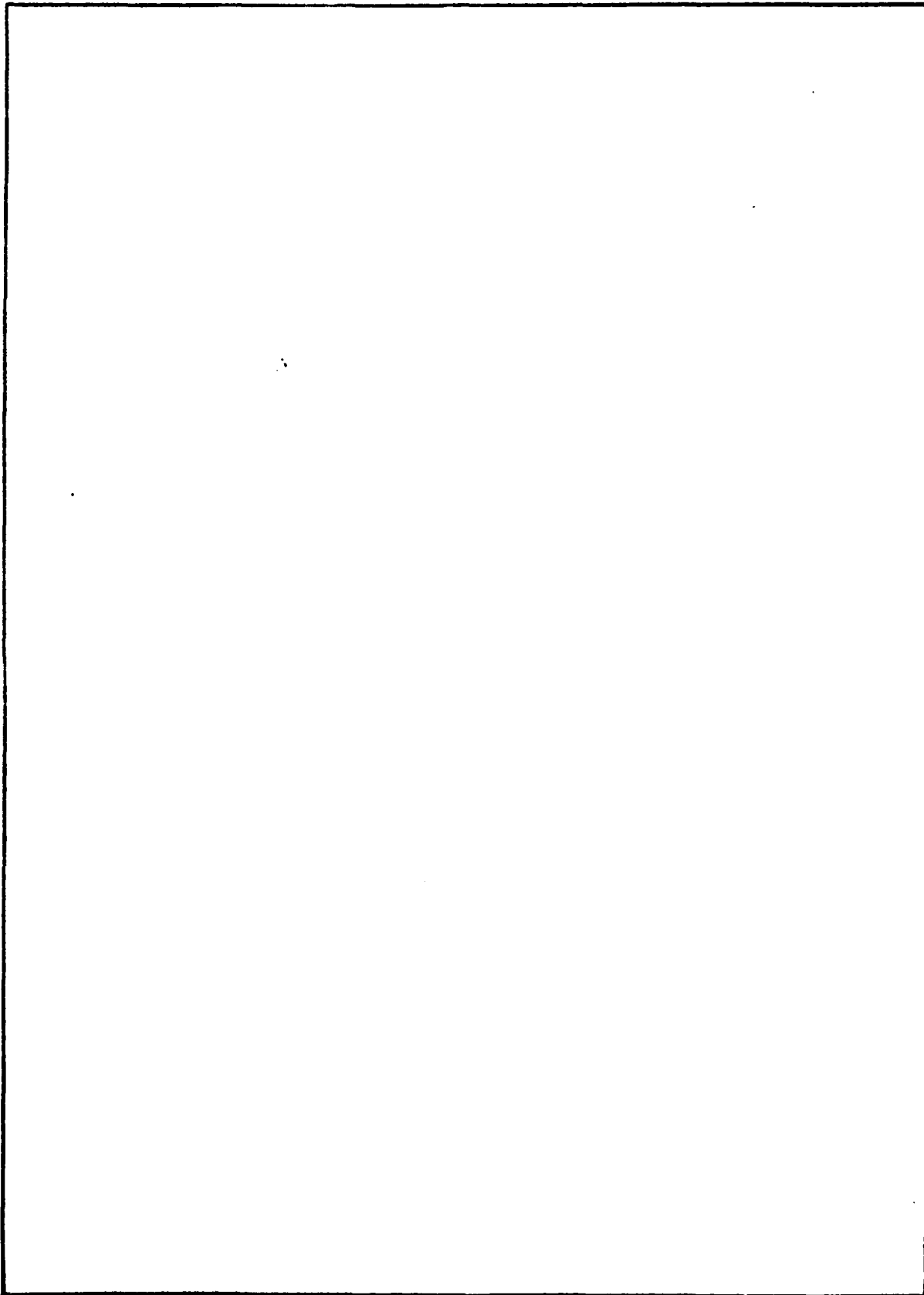
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